

Preliminary report for IODP Expedition 345 Hess Deep Plutonic Crust

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IODP Exp. 345, Hess Deep Plutonic Crust was conducted drilling into the oceanic lower crust from December 13, 2012 to February 12, 2013. The principal objective for drilling at the Hess Deep Rift located in the equatorial Pacific was, to test competing hypotheses of magmatic accretion (gabbro glacia vs. sheet sill models) and hydrothermal processes in the lower ocean crust formed at the fast-spreading East Pacific Rise (EPR). These hypotheses make predictions that can only be tested by drilling, i.e., the presence or absence of systematic variations with depth in mineral and bulk rock compositions, presence or absence of modally layered gabbro, and the extent and nature of hydrothermal alteration and deformation.

The drilling was carried out in ~4850 m water depth under quite challenging borehole conditions. We recovered primitive plutonic lithologies; olivine gabbro, troctolite, gabbro, orthopyroxene-bearing gabbroic rocks. The recovered rocks exhibit cumulate textures similar to those found in layered mafic intrusions and some ophiolite complexes. Details of their mineralogical and petrologic evolution, however, are novel on the ocean floor.

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